

REMARKS

Claims 12-40 are pending in this application. By this Amendment, claims 12, 13, 24, 26, 27 and 40 are amended for clarity. No new matter is added.

I. Comments on Statement of Reasons for Allowance

The Office Action states at page 5, line 1 "a rage of crystal growth." However, this should read "a rate of crystal growth."

II. Allowable Subject Matter

Applicants appreciate the Examiner's indication that claims 24-39 are allowed. However, the Office Action also indicates that claim 24 is rejected under 35 U.S.C. §112, second paragraph, as discussed below. Applicants assume that claim 24 would be allowable if the rejection under 35 U.S.C. §112, second paragraph, is overcome. Because the rejection is overcome as discussed below, claims 24-39 are in condition for allowance.

III. Claim Rejections under 35 U.S.C. §112

Claims 12, 24 and 40 are rejected under 35 U.S.C. §112, second paragraph, because the term "type" is allegedly indefinite. Applicants assert that the claims are not indefinite. Nevertheless, to expedite prosecution of this application, "type" is removed from claims 12, 24 and 40.

Withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is respectfully requested.

IV. Claim Rejections under 35 U.S.C. §103

Claims 12-23 and 40 are rejected under 35 U.S.C. §103(a) over PCT Application No. WO 0127362 to Kimura et al. (Kimura) in view of Japanese Laid Open Patent Application 2001-274167 to Katsuhiko et al. (Katsuhiko). The rejection is respectfully traversed.

Claims 12 and 40 recite a silicon wafer wherein the "number of the defects having an opening size of 20 nm or less among void defects appearing on a surface of the wafer is 0.02/cm²

or less." At least this feature is absent from Kimura. Kimura discloses a silicon single crystal wafer with a large etch pits (LEP) density of 20 per square centimeter.

More specifically, independent claims 12 and 40 have characteristic features of "with doping nitrogen," "grown in the region where at least the center of the wafer becomes V region in which void defects are generated" and "the number of the defects having an opening size of 20 nm or less among the void defects appearing on a surface of the wafer is $0.02/\text{cm}^2$ or less."

The Office Action asserts that the difference between the present invention and Kimura is that a slicing or "cutting" step is not taught by Kimura and the Office Action does not acknowledge that there are other differences between the present invention and Kimura. Regarding this point, it appears that the Office Action concludes that the features of claims 12 and 40, except for a slicing or "cutting" step, are described in Kimura because in the Abstract of Kimura, "doped with nitrogen" and "the whole surface is a V-rich region" or "doped with nitrogen" and "an OSF region is provided in the surface, the LEP density in the OSF region is 20 pieces/ cm^2 or less or the OSF density is 1×10^4 piece/ cm^2 or less" are described.

However, the Office Action's conclusion is incorrect. In Kimura, there is no description regarding the feature of claims 12 and 40 that "the number of the defects having an opening size of 20 nm or less among the void type defects appearing on a surface of the wafer is $0.02/\text{cm}^2$ or less." The Office Action is apparently misconstruing the feature of Kimura that "an OSF region is provided in the surface, the LEP density in the OSF region is 20 pieces/ cm^2 or less or the OSF density is 1×10^4 piece/ cm^2 or less" as if it is the same as the feature of "the number of the defects having an opening size of 20 nm or less among the void defects appearing on a surface of the wafer is $0.02/\text{cm}^2$ or less," as recited in claims 12 and 40. However, what is defined in Kimura is not "the number of void defects" but "the LEP density" and "the OSF density."

U.S. Patent No. 6,548,035 (hereinafter the '035 Patent) is the U.S. counterpart of Kimura.¹ As described in col. 7, lines 49-58 and col. 8, lines 52-56 and the like of the '035 Patent, "LEP" described in Kimura is the defect derived from "dislocation clusters." The "dislocation clusters" are due to dislocations generated by the presence of excessive silicon atoms (see col. 6, lines 38-42 of the '035 Patent), that is, interstitial defects. And also, "OSF" is oxidation-induced stacking faults which are confirmed in the N-region (see col. 6, lines 45-49 of the '035 Patent). On the other hand, "void defects" described in claims 12 and 40 of the present application are due to lack of silicon atoms (see col. 6, lines 34-38 of the '035 Patent). That is, "LEP" and "OSF" of Kimura are completely different from "void type defects" of claims 12 and 40 of the present application. That is, in Kimura, there is no description of "the number of void defects," and as a matter of course, there is neither description nor suggestion at all regarding the feature of "the number of the defects having an opening size of 20 nm or less among the void defects appearing on a surface of the wafer is 0.02/cm² or less."

Therefore, even if Kimura is combined with Katsuhiko, the present application cannot be derived from the combination as long as there is no description of the feature of "the number of the defects having an opening size of 20 nm or less among the void defects appearing on a surface of the wafer is 0.02/cm² or less" in both of Kimura and Katsuhiko.

Furthermore, Kimura and Katsuhiko fail to teach or suggest a method for producing "a silicon wafer for epitaxial growth," which has features of "with doping nitrogen," "grown in the region where at least the center of the wafer becomes V region in which void defects are generated" and "the number of the defects having an opening size of 20 nm or less among the void defects appearing on a surface of the wafer is 0.02/cm² or less." Accordingly, it is impossible to

¹ A copy of the '035 patent is attached.

produce "a silicon wafer for epitaxial growth" of claim 12 of the present application from the descriptions of Kimura and Katsuhiko.

Katsuhiko fails to cure the deficiency of Kimura. For the reasons set forth above, Kimura does not teach the claimed subject matter. Kimura does teach slicing of silicon single crystals. However, even using the slicing of Katsuhiko with a silicon single crystal according to Kimura does not yield the wafers as claimed.

In addition, "a silicon wafer for epitaxial growth" of claim 12 of the present application can be produced by, for example, the method described in claim 24 of the present application. Thus, because the producing method described in claim 24 of the present application is allowable, as acknowledged by the Office Action, claim 12 is also allowable.

In summary, neither Kimura nor Katsuhiko, or any combination thereof, teach a silicon wafer wherein the "number of the defects having an opening size of 20 nm or less among void defects appearing on a surface of the wafer is $0.02/\text{cm}^2$ or less," as recited by claims 12 and 40. Thus, Kimura and/or Katsuhiko fail to render obvious the subject matter of claims 12 and 40, and claims 12 and 40 are in condition for allowance.

Claims 13-23 depend from claim 12. Because claim 12 is in condition for allowance, claims 13-23 are in condition for allowance as well, for at least the reasons set forth above, as well as for the features recited therein.

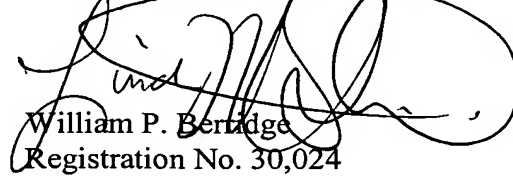
For the reasons set forth above, withdrawal of the rejection under 35 U.S.C. §103(a) is respectfully requested.

V. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the pending claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,


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WPB:LMS:GMH/ccs

Attachment:

U.S. Patent No. 6,548,035

Date: October 24, 2006

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